This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for removing and recovering ~~an~~ a **perfluoroalkylsulfonate or a perfluoroalkyl carboxylate** ion from a solution comprising:

(a) contacting said solution with a solid ion extractant comprising a recyclable activated ion coordinating agent to remove at least a portion of said ion from said solution;

(b) deactivating said ion coordinating agent;

(c) dissolving said ion in a recovery solvent and removing said ion from said solid ion extractant; and

(d) recovering said ion from said recovery solvent.

2-3. (Cancelled)

4. (Original) The method of Claim 1, wherein said ion coordinating agent comprises a lipophilic portion.

5. (Original) The method of Claim 1, wherein said active ion coordinating agent is ionizable in an aqueous solution.

6. (Original) The method of Claim 1, wherein said step of removing said ion from said solution comprises an ion-exchange process.

7. (Original) The method of Claim 1, wherein said ion coordinating agent is an organometallic compound.

8. (Original) The method of Claim 7, wherein said ion coordinating agent is redox-recyclable.

9. (Original) The method of Claim 8, wherein said ion coordinating agent is oxidized prior to said step (a).

10. (Original) The method of Claim 9, wherein said oxidation step comprises an electrochemical oxidation process.

11. (Original) The method of Claim 9, wherein said oxidation step comprises a chemical oxidation process.

12. (Original) The method of Claim 8, wherein said deactivation step comprises reducing said ion coordinating agent.

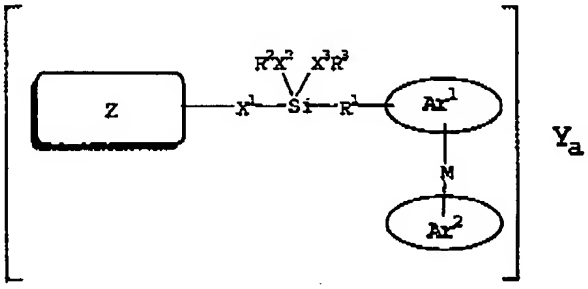
13. (Original) The method of Claim 12, wherein said reduction step comprises an electrochemical reduction process.

14. (Original) The method of Claim 12, wherein said reduction step comprises a chemical reduction process.

15. (Original) The method of Claim 14, wherein said chemical reduction process comprises contacting said solid ion extractant with a deactivating solution.

16. (Original) The method of Claim 15, wherein said deactivating solution comprises a compound selected from the group consisting of $Na_4Fe(CN)_6$, $K_4Fe(CN)_6$, $Na_2S_2O_4$, Cr^{2+} salt, V^{2+} salt and $NaBH_4$.

17. (Original) The method of Claim 1, wherein said solid ion extractant is a composition of the formula:



wherein

each of Ar^1 and Ar^2 is independently C_4-C_{20} aryl;

M is a transition metal;

R^1 is C_2-C_{20} alkylene;

each of X^1, X^2 and X^3 is independently a bond, O, S, or NR^4;

each of R^2, R^3 and R^4 is independently H, or C_1-C_6 alkyl;

Z is a solid support;

Y is an anion; and

a is 0 when said ion coordinating agent is deactivated, and

a is an integer from 1 to 3 when said ion coordinating agent is activated.

18. (Original) The method of Claim 17, wherein M is selected from the group consisting of Fe, Ru, Mn, Co, Ni, Cr, Os, Rh and Ir.

19. (Original) The method of Claim 17, wherein Ar^1 and Ar^2 are selected from the group consisting of cyclopentadienyl, dicarbollide and phenyl, each of which can be optionally substituted.

20. (Original) The method of Claim 17, wherein each of X^1, X^2 and X^3 is independently a bond or O.

21. (Original) The method of Claim 17, wherein R^2 and R^3 are C_1-C_6 alkyl.

22. (Original) The method of Claim 17, wherein said solid support is glass or a polymeric resin.

23. (Original) The method of Claim 22, wherein said polymeric resin is selected from the group consisting of acrylic ester, polyvinyl, polystyrene, polypyrrole, polyolefin, and polyaromatic.

24. (Original) The method of Claim 17, wherein Y is selected from the group consisting of nitrate, halide, HSO_4^-, ClO_4^-, ReO_4^-, PF_6^-, carboxylate and $CF_3SO_3^-$.

25. (Original) The method of Claim 17, wherein a is 1 when said ion coordinating agent is activated.

26. (Original) The method of Claim 1, wherein said solution is an aqueous solution.

27. (Original) The method of Claim 26, wherein the temperature of solution of said step (a) is least about 24 °C.

28. (Original) The method of Claim 1, wherein the temperature of said recovery solution is at least about 85 °C.

29. (Original) The method of Claim 28, wherein said recovery step (d) comprises reducing the temperature of said recovery solution to less than about 5 °C to precipitate said ion.

30. (Original) The method of Claim 29, wherein said recovery step further comprises separating said precipitated ion from said recovery solution.

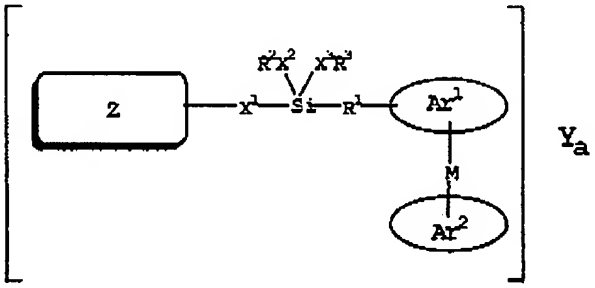
31. (Original) The method of Claim 1, further comprising:

(e) re-activating said deactivated ion coordinating agent; and

(f) repeating said steps (a)-(e).

32. (Original) A method for removing and recovering an anion from an aqueous solution comprising:

(a) contacting said solution with a solid ion extractant comprising an ion coordinating agent to remove at least a portion of said anion from said aqueous solution, wherein said solid ion extractant is a composition of the formula:



wherein

each of Ar^1 and Ar^2 is independently C_4-C_{20} aryl;

M is a transition metal;

R^1 is C_2-C_{20} alkylene;

each of X^1, X^2 and X^3 is independently a bond, O, S, or NR^4;

each of R^2, R^3 and R^4 is independently H, or C_1-C_6 alkyl;

Z is a solid support;

Y is an anion; and

a is an integer from 1 to 3;

(b) reducing said ion coordinating agent in said solid ion extractant such that a is 0;

(c) dissolving said anion in a recovery solvent and removing said anion from said solid ion extractant; and

(d) recovering said anion.

33. (Original) The method of Claim 32, wherein said anion is a perfluoroalkyl sulfonate or perfluoroalkyl carboxylate.

34. (Original) The method of Claim 32, wherein said step of removing said anion from said aqueous solution comprises an ion-exchange process.

35. (Original) The method of Claim 32, wherein a in said step (a) is 1.

36. (Original) The method of Claim 32, wherein said ion coordinating agent is redox-recyclable.

37. (Original) The method of Claim 36, further comprising a step of oxidizing said ion coordinating agent from a=0 to a=1 prior to said step (a).

38. (Original) The method of Claim 37, wherein said oxidizing step comprises an electrochemical oxidation process.

39. (Original) The method of Claim 37, wherein said oxidizing step comprises a chemical oxidation process.

40. (Original) The method of Claim 36, wherein said deactivation step comprises reducing said ion coordinating agent.

41. (Original) The method of Claim 40, wherein said reducing step comprises an electrochemical reduction process.

42. (Original) The method of Claim 40, wherein said reducing step comprises a chemical reduction process.

43. (Original) The method of Claim 42, wherein said chemical reduction process comprises contacting said solid ion extractant with a deactivating solution.

44. (Original) The method of Claim 43, wherein said deactivating solution comprises a compound selected from the group consisting of $Na_4Fe(CN)_6$, $K_4Fe(CN)_6$, $Na_2S_2O_4$, Cr^{2+} salt, V^{2+} salt and $NaBH_4$.

45. (Original) The method of Claim 32, wherein M is selected from the group consisting of Fe, Ru, Mn, Co, Ni, Cr, Os, Rh and Ir.

46. (Original) The method of Claim 45, wherein Ar^1 and Ar^2 are selected from the group consisting of cyclopentadienyl, dicarbollide and phenyl, each of which can be optionally substituted.

47. (Original) The method of Claim 46, wherein each of X^1, X^2 and X^3 is independently a bond or O.

48. (Original) The method of Claim 47, wherein R^2 and R^3 are C_1-C_6 alkyl.

49. (Original) The method of Claim 48, wherein said solid support is glass or a polymeric resin.

50. (Original) The method of Claim 49, wherein said polymeric resin is selected from the group consisting of acrylic ester, polyvinyl, polystyrene, polypyrrole, polyolefin, and polyaromatic.

51. (Original) The method of Claim 50, wherein Y is selected from the group consisting of nitrate, halide, HSO_4^-, ClO_4^-, ReO_4^-, PF_6^-, carboxylate and $CF_3SO_3^-$.

52. (Original) The method of Claim 32, wherein the temperature of said aqueous solution of said step (a) is least about 24 °C.

53. (Original) The method of Claim 52, wherein the temperature of said recovery solution is at least about 85 °C.

54. (Original) The method of Claim 53, wherein said recovery step (d) comprises reducing the temperature of said recovery solution to less than about 5 °C to precipitate said anion.

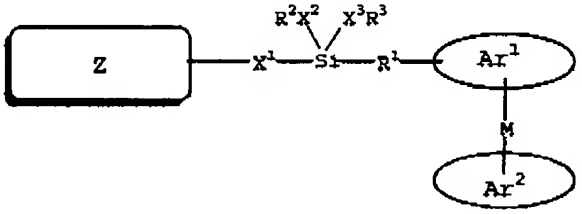
55. (Original) The method of Claim 54, wherein said recovery step further comprises separating said precipitated ion from said recovery solution.

56. (Original) The method of Claim 32, further comprising:

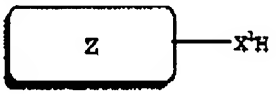
(e) re-activating said deactivated ion coordinating agent; and

(f) repeating said steps (a)-(e).

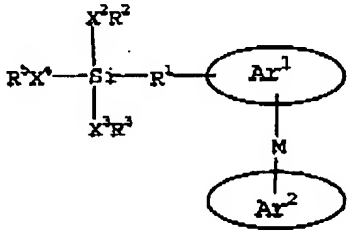
57. (Original) A process for producing a solid ion extractant composition of the formula:



said process comprising contacting the solid support of the composition:



with an ion coordinating agent of the formula:



wherein

each of Ar^1 and Ar^2 is independently C_4-C_{20} aryl;

each of X^1, X^2, X^3 and X^4 is independently a bond, O, S, or NR^4;

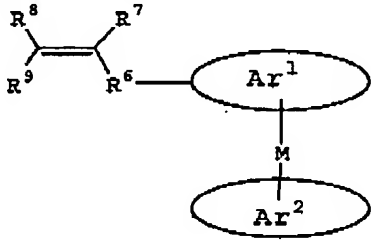
R^1 is C_2-C_{20} alkylene;

each of R^2, R^3, R^4 and R^5 is independently H, or C_1-C_6 alkyl;

M is a transition metal; and

Z is a solid support.

58. (Original) The process of Claim 57, further comprising the step of producing said ion coordinating agent, wherein said ion coordinating agent producing step comprises contacting an olefin of the formula:



with a silyl compound of the formula $HSi(X^2R^2)(X^3R^3)(X^4R^5)$ in the presence of a catalyst to produce said ion coordinating agent,

wherein

R^6 is a bond or C_1-C_{18} alkylene; and

each of R^7, R^8 and R^9 is independently H or C_1-C_6 alkyl.

59. (Original) The method of Claim 58, wherein said catalyst is selected from the group consisting of Karstedt's catalyst, Speier's catalyst, other silylplatinum complexes, transition metal nanoclusters, dicobalt octacarbonyl, nickel tetracarbonyl, Wilkonson's catalyst, chromium hexacarbonyl, and zirconocenes.

60. (Original) The process of Claim 57, wherein M is selected from the group consisting of Fe, Ru, Mn, Co, Ni, Cr, Os, Rh and Ir.

61. (Original) The process of Claim 60, wherein Ar^1 and Ar^2 are selected from the group consisting of cyclopentadienyl, dicarbollide and phenyl, each of which can be optionally substituted.

62. (Original) The process of Claim 61, wherein each of X^1, X^2 and X^3 are independently a bond or O.

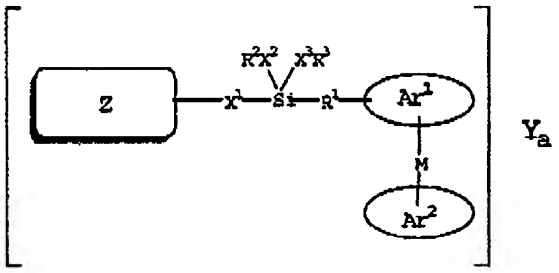
63. (Original) The process of Claim 62, wherein X^4 is O.

64. (Original) The process of Claim 63, wherein R^2, R^3 and R^5 are C_1-C_6 alkyl.

65. (Original) The process of Claim 64, wherein said solid support is glass or a polymeric resin.

66. (Original) The process of Claim 65, wherein said polymeric resin is selected from the group consisting of acrylic ester, polyvinyl, polystyrene, polypyrrole, polyolefin, and polyaromatic.

67. (Original) The process of Claim 57, further comprising oxidizing said solid ion extractant to produce an activated solid ion extractant of the formula:



wherein

Y is an anion; and

a is an integer from 1 to 3.

68. (Original) The process of Claim 67, wherein a is 1.

69. (Original) The process of Claim 67, wherein Y is selected from the group consisting of nitrate, halide, HSO_4^-, ClO_4^-, ReO_4^-, PF_6^-, carboxylate and $CF_3SO_3^-$.

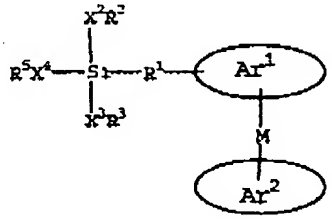
70. (Original) The process of Claim 67, wherein said oxidizing step comprises an electrochemical oxidation process.

71. (Original) The process of Claim 67, wherein said oxidizing step comprises a chemical oxidation process.

72. (Original) The process of Claim 71, wherein said chemical oxidation process comprises contacting said solid ion extractant with a solution comprising an oxidant to produce said activated solid ion extractant.

73. (Original) The process of Claim 72, wherein said oxidant is selected from the group consisting of $Fe(NO_3)_3$, $AgNO_3$, $FeCl_3$, AgF, NaOCl, $Ce(NH_4)_2(NO_3)_6$ and $Ce(SO_4)_2$.

74. (Original) A compound of the formula:



wherein

each of Ar^1 and Ar^2 is independently C_4-C_{20} aryl;
each of X^1, X^2, X^3 and X^4 is independently a bond, O, S, or NR^4;
R^1 is C_2-C_{20} alkylene;
each of R^2, R^3, R^4 and R^5 is independently H, or C_1-C_6 alkyl; and
M is a transition metal.

75. (Original) The compound of Claim 74, wherein M is selected from the group consisting of Fe, Ru, Mn, Co, Ni, Cr, Os, Rh and Ir.

76. (Original) The compound of Claim 74, wherein Ar^1 and Ar^2 are selected from the group consisting of cyclopentadienyl, dicarbollide and phenyl, each of which can be optionally substituted.

77. (Original) The compound of Claim 74, wherein each of X^1, X^2, X^3 and X^4 is independently a bond or O.

78. (Original) The compound of Claim 74, wherein R^2 and R^3 are C_1-C_6 alkyl.